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Impact of Forestry Activity on the Economy of Canada and Its Provinces: An Input-Output Approach

Romain Jacques

Information Report E-X-39
Economics Branch, Canadian Forestry Service

THE CANADIAN FORESTRY SERVICE
GOVERNMENT OF CANADA

The Canadian Forestry Service is the principal source of federal expertise in forestry and has been designated as the government's lead agency for forestry matters. Its general objective is to promote the wise management and use of Canada's forest resources for the economic, social, and environmental benefit of Canadians.

The following are the main functions of the CFS:

1. Coordination of federal policies for the promotion of better resource management and forest industry development.
2. Provision of scientific and technological leadership in forestry through research and development.
3. Provision and analysis of national and international statistics and information as a basis for policy formulation.
4. Development and certification of codes and standards for wood product performance.
5. Protection of Canada's forests from foreign pests.
6. Fostering the potential use of the forest resource for energy.
7. Contributing to the environmental objectives of the Government of Canada.

Canadian Forestry Service programs are coordinated with those of other forestry agencies through a variety of mechanisms, including the Canadian Council of Forestry Ministers, the Forest Sector Strategy Committee, management committees for Federal-Provincial Forestry Development programs, national and regional Research Advisory Committees, and various technical committees for specific program areas.

The Canadian Forestry Service comprises a headquarters unit, six forestry centres, and two national institutes. The forestry centres are responsive to regional priorities and maintain close liaison with the respective provincial government forestry departments and other clients. They also participate in, and frequently lead, national programs. The national institutes provide the focus for programs of national scope.

SERVICE CANADIEN DES FORÊTS
GOUVERNEMENT DU CANADA

Le Service canadien des forêts (SCF) réunit la majorité des spécialistes fédéraux en foresterie; il a été désigné comme l'organisme officiel du gouvernement responsable du secteur forestier. Son objectif général est de promouvoir l'aménagement et l'utilisation judicieux des ressources forestières du Canada pour le plus grand bien économique, social et environnemental des Canadiens.

Voici les principales fonctions du SCF:

1. Coordonner les politiques fédérales afin de favoriser l'amélioration de la gestion des ressources et l'expansion de l'industrie forestière.
2. Fournir une orientation scientifique et technologique dans le domaine de la foresterie, par la recherche et le développement.
3. Fournir et analyser les statistiques et l'information nationales et internationales qui serviront à établir les politiques.
4. Mettre au point et homologuer des codes et des normes en matière de rendement des produits du bois.
5. Protéger les forêts canadiennes en luttant contre les ravageurs étrangers.
6. Parrainer l'utilisation éventuelle des ressources forestières pour la production d'énergie.
7. Adhérer aux objectifs environnementaux du gouvernement fédéral.

Les programmes du SCF sont menés de concert avec ceux d'autres organismes forestiers par l'entremise de divers mécanismes dont le Conseil canadien des ministres des Forêts, le Comité de la stratégie forestière, les comités de gestion des programmes fédéraux-provinciaux de développement forestier, les comités nationaux et régionaux consultatifs sur la recherche, de même que divers comités techniques axés sur des domaines de programmes spécifiques.

Le SCF comprend une administration centrale, six centres de foresterie et deux instituts nationaux. Les centres de foresterie doivent répondre aux impératifs régionaux et entretenir une liaison étroite avec les ministères provinciaux des Forêts. Ils participent également à des programmes nationaux dont ils assument fréquemment la direction. Les instituts nationaux sont les foyers des programmes d'envergure nationale.

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ABSTRACT

This study uses Statistics Canada input-output models to assess the links between the forest sector and other sectors of the economy. In 1980, an estimated 532 000 jobs in other sectors of the economy were associated with the 302 000 jobs in the forest sector; thus, **forestry activity** accounted for 834 000 jobs, or 7.8% of all jobs in Canada. Between 1980 and 1984, the loss of 34 000 jobs in the forest sector led to an estimated loss of 60 000 jobs in other sectors. The share of total provincial revenue (gross domestic product at factor cost) generated by **forestry activity** by province was 26% for British Columbia, 16% for New Brunswick, 9% for Newfoundland and Quebec, 6% for Nova Scotia, and 5% for Ontario, while 9% of Canada's revenue was generated by **forestry activity**. An estimated 1.76 jobs in other sectors of the Canadian economy were associated with each job in the forest sector, and this employment ratio ranged between 1.6 and 2.1 on a provincial basis. An estimated 83% of logging industry production depends on **forest product** exports, although only 2% of such production is exported in unprocessed forms. British Columbia is one of the provinces that receives the least spin-off effect per volume of wood harvested. Total effects in Quebec and Ontario are comparable to that in British Columbia, but harvest volumes are much lower in these provinces.

INTRODUCTION

This study uses Statistics Canada input-output models to estimate the economic activity generated by processing of the forest into consumer goods. The 1979 interprovincial model was used to estimate the impact of **forestry activity**[1] in each of the 10 Canadian provinces, while the 1980 national model was used to estimate the impact on Canada as a whole. The input-output models enabled us to estimate the impact of **forestry activity** on some 200 different sectors of the economy in terms of output levels (in dollars), number of jobs, and gross domestic product (in dollars).

In addition to the total impact of **forestry activity** on the economy, the impact of **forest product** exports alone is presented. The enormous benefits that Canada and its provinces derive from **forest product** exports, in terms of employment and value added, are calculated, taking into account the links between **forest industries** and their suppliers.

This report is divided into three sections, followed by two technical appendices and a detailed presentation of results. The first section briefly describes the operation of the model. The second presents the results obtained with the interprovincial model. This section first details the level of activity of **forest industries** in each province, then presents the impact of **forestry activity** on all sectors of the economy. Forestry's overall contribution to the economy of each province is then described briefly. Employment ratios are estimated, and the impact per volume of harvest is determined. This section ends with a breakdown of the impact by demand category.

The third section presents the results of the national model. It begins by describing the impact on **forest industries**, then the impact on all sectors of the economy. The overall importance of **forestry activity** is then described, and employment ratios are calculated. The impact per volume of wood harvested is also estimated, and the importance of exports is then shown. Finally, the contribution of **indirect** and **induced effects** toward the **total effects** is estimated.

This report is supplemented by two technical appendices on the workings of the models and the simulations made, and by a detailed presentation of results.

OPERATION OF MODELS

To estimate the economic activity generated by the forest, one begins by calculating the production, number of jobs, and value added of the logging industry. It then seems natural to add the production, jobs, and value added of the wood industries and of the paper and allied products industries, claiming (largely rightly so) that activity in these industrial sectors would cease without raw materials. The final stage is determining how much of the production of other sectors of the economy is traceable to the activity of **forest industries**. This is where intersectoral models are particularly useful.

The intersectoral models used here assume that consumption is the purpose of all production activities. They are designed to determine the production efforts needed to meet a given level of demand. In other words, the models estimate the spin-off effects of an initial impact on demand. This study attempts to determine the spin-off effects generated by the 1979 and 1980 demand for **forest products** on all sectors of the economy. Assuming that the structure of the economy is still fundamentally the same, knowledge of the links between **forest industries** and other sectors of the economy at that time will enable us to assess the impact of **forestry activity** on today's economy.

To produce a ton of newsprint, pulp and paper mills require roundwood, wood chips, energy in all forms, chemicals, equipment of all sorts, insurance policies, financial services, and several other intermediate goods. They also need labor, and must pay their capital. This first effect on the multitude of intermediate goods, labor, and capital is called the **direct effect**.

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[1] Terms printed in boldface are explained in the glossary at the end of this report.

Whenever pulp and paper mills order an intermediate good, they generate economic activity in another sector of the economy. This sector itself, to produce what pulp and paper mills have ordered, needs other intermediate goods and so forth. This spin-off effect of the pulp and paper industry on other sectors of the economy is called the **indirect effect**. Statistics Canada's **open model** estimates the **direct** and **indirect effects** generated by the production of certain goods.

Added to the **indirect effect** is another spin-off effect. In the production of newsprint or of one of the intermediate goods needed for newsprint production, the various sectors of the economy hire labor. Consumer goods purchased by these workers generate economic activity in various sectors of the economy, which in turn generate further activity. This spin-off effect of worker spending on the various sectors of the economy is called the **induced effect**. The Statistics Canada **closed model** estimates the **direct, indirect,** and **induced effects** of the production of certain goods.

This study uses the Statistics Canada **closed model** to estimate the **direct, indirect,** and **induced effects** (henceforth referred to as the **total effects**) of the processing of **forest products** on various sectors of the economy.[2] This report will show that the **total effects** are initially concentrated in **forest industries**, but also have an important impact on other sectors of the economy. Provincial simulations are conducted to estimate the impact of **forestry activity** within individual provinces, as well as the impact on other provinces. It is thus possible to estimate not only the links that bind the **forest industries** of a province to the other sectors of the provincial economy, but also those that bind it to the sectors of the economy of the other provinces.

INTERPROVINCIAL MODEL RESULTS

This section summarizes the results for each of the provinces; information about national impacts is set out in the following section. The sum of provincial results will not provide an accurate national estimate because it involves a slight amount of double counting. Since the **forestry activity** of a province has a spin-off effect in all sectors (including the forest sector) of neighboring provinces, the addition of provincial impacts overstates the **total effect**. For example, nearly 9% of logging industry production in Quebec is accounted for in calculating the impact of **forestry activity** in Ontario; therefore, the sum of the impact of **forestry activity** in Quebec and in Ontario would involve double counting 9% of the effects of Quebec logging industries. Moreover, simulations at the national level are carried out with a more recent model.

Impact on Provincial Forest Industries

To determine the validity of the model, estimated output levels from model simulations were compared with actual observed output levels in the forest sector. Table 1 shows that for larger industries (logging, sawmills, and pulp and paper), the results of the simulations come very close to actual observed output levels, while estimates can be at greater variance for smaller **forest industries**. Moreover, the simulations generally underestimate output levels. This latter problem can be partially explained by differences in product coverage. The simulation estimates only the production of **forest products** by the **forest industries** while Census of Manufacturers data includes production of non-forest products by the **forest industries**.

In general terms, the model performs satisfactorily. In more than three quarters of the results, there is a difference of less than 10% between the simulation results and the actual production figures. At the other extreme, one tenth (exactly six) of the simulation results differ by more than 33% from actual production figures. The simulation results on the number of jobs by industry are even closer to the actual figures (Table 2).

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[2]For a detailed description of the operation of the model and of the results of simulations conducted as part of this study, see appendices A, B, and C.

Table 1. Impact of forestry activity in a province on the production level ($000) of its forest industries in 1979

		Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
2[a]	Logging	54 324[b]	45	90 336	216 033	669 617	568 687	36 779	54 468	73 216	259 617
		x[c]	x	**92 346**	**227 681**	**703 867**	**588 598**	**37 242**	**60 053**	**74 276**	**2 376 595**
59	Sawmills	5 827	1 428	49 608	153 590	986 720	506 796	36 476	45 523	168 880	3 953 409
		5 951	x	**51 723**	**155 622**	**1 000 106**	**504 396**	**36 546**	**45 324**	**168 502**	**3 948 562**
60	Veneer and plywood industries	2 546	0	0	25 955	110 876	114 843	0	12 053	37 679	601 377
		x	**0**	**0**	x	**138 043**	**130 295**	**0**	x	x	**614 726**
61	Sash, door, and other millwork industries	5 308	5 398	31 401	35 538	397 360	363 784	65 760	31 018	191 200	255 364
		x	**6 492**	x	x	**421 301**	**412 569**	**77 934**	**40 987**	**246 065**	**271 126**
62	Wooden box industries	169	0	2 533	832	27 216	140 356	2 889	136	1 798	8 775
		0	x	**1 591**	x	**42 741**	**129 230**	x	x	x	**13 328**
63	Coffin industries	45	0	837	793	18 110	6 433	478	270	1 192	2 218
		x	**0**	x	x	**17 468**	**6 087**	x	x	**1 971**	**2 154**
64	Other wood industries	6 078	0	8 390	27 945	81 165	198 872	2 145	29 089	23 660	64 310
		x	**0**	**8 661**	**32 371**	**85 177**	**200 637**	**2 281**	x	**24 938**	**64 523**
69	Pulp and paper mills	259 467	0	284 868	620 291	3 164 174	2 220 946	103 722	121 576	168 323	2 357 693
		261 945	**0**	**284 120**	**666 700**	**3 320 494**	**2 299 551**	x	x	**170 177**	**2 432 008**
70	Asphalt roofing industry	0	0	0	0	62 916	67 931	17 399	0	44 720	13 423
		0	**0**	**0**	**0**	**94 434**	**71 813**	x	**0**	**58 180**	x
71	Paper box and bag industry	7 937	0	19 615	25 482	485 036	858 002	64 567	9 187	55 505	177 426
		x	**0**	**19 895**	**26 628**	**498 757**	**906 026**	**68 720**	x	x	**172 504**
72	Other converted paper products industries	965	0	21 214	0	264 479	587 967	28 620	3 679	9 558	31 372
		x	**0**	**18 151**	**0**	**318 435**	**747 158**	**30 358**	**3 387**	x	x
Total forest industries		342 666	6 871	508 802	1 106 459	6 267 669	5 634 617	358 835	306 999	775 731	10 056 984
		x	x	x	x	**6 640 823**	**5 996 360**	x	x	x	x

[a]Input-output classification of industry.
[b]Figures in regular print are the results of simulations and those in boldface are observed values (source: Census of Manufacturers).
[c]Confidential.

Table 2. Impact of forestry activity in a province on employment in its forest industries in 1979

		Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
2[a]	Logging	1 798[b] **1 791**	1.8 **2**	2 789.6 **2 770**	4 586.4 **4 974**	14 852.1 **15 464**	11 680.8 **11 833**	1 201.2 **1 228**	1 028.9 **1 107**	2 304.1 **2 244**	23 480.1 **23 819**
59	Sawmills	220.3 **223**	41.9 x[c]	1 303.7 **1 306**	2 455.9 **2 507**	16 863.1 **16 918**	7 176.2 **7 223**	417.3 **420**	631.4 **642**	2 502.8 **2 523**	38 862.0 **39 043**
60	Veneer and plywood industries	22.4 x	0 **0**	0 **0**	404.4 x	1 979.1 **2 081**	2 422.0 **2 470**	0 **0**	237.1 x	406.9 x	7 914.1 **7 930**
61	Sash, door, and other millwork industries	101.2 x	128.3 **145**	674.5 x	750.6 x	7 629.3 **7 904**	7 006.5 **7 517**	1 359.9 **1 518**	366.0 **563**	3 059.2 **3 523**	3 483.2 **3 509**
62	Wooden box industries	5.9 **0**	0 x	51.7 **51**	28.5 x	888.3 **953**	2 578.3 **2 593**	69.9 x	5.0 x	44.1 x	207.8 **206**
63	Coffin industries	2.1 x	0 **0**	29.2 x	20.0 x	460.5 **440**	197.2 **190**	7.8 x	4.0 x	40.1 **47**	42.2 **37**
64	Other wood industries	84.4 x	0 **0**	125.0 **125**	492.1 **599**	1 689.9 **1 839**	3 068.6 **3 136**	58.3 **58**	419.2 x	447.4 **452**	774.9 **782**
69	Pulp and paper mills	2 527.2 **2 611**	0 **0**	2 458.4 **2 522**	5 632.2 **5 782**	31 578.5 **32 330**	22 142.8 **22 539**	861.9 x	457.1 x	1 333.1 **1 389**	18 390.0 **18 557**
70	Asphalt roofing industry	0 **0**	0 **0**	0 **0**	0 **0**	512.1 **561**	420.5 **439**	104.6 x	0 **0**	204.8 **225**	108.6 x
71	Paper box and bag industries	92.9 x	0 **0**	268.3 **275**	349.1 **363**	7 154.2 **7 290**	12 338.1 **12 846**	889.1 **911**	108.0 x	863.7 x	2 017.3 **1 938**
72	Other converted paper products industries	24.8 x	0 **0**	381.9 **378**	0 **0**	3 583.7 **4 157**	8 590.2 **10 355**	281.3 **288**	47.0 **46**	148.7 x	396.5 x
Total forest industries		4 882.2 x	175 x	8 082.3 x	14 719.2 x	87 190.3 **89 937**	77 621.2 **81 141**	5 251.3 x	3 303.7 x	11 354.9 x	95 676.7 x

[a]Input-output classification of industry.
[b]Figures in regular print are the results of simulations and those in boldface are observed values (source: Census of Manufacturers).
[c]Confidential.

Impact on All Sectors of the Economy of the Provinces

As we have indicated, **forestry activity**, specifically processing of the forest into **forest products**, generates economic activity in **forest industries** as well as in other sectors of the economy. The following section is a summary of the estimated impacts in each of the provinces on employment and the gross domestic product (GDP) at factor cost.

A quick glance at the GDP generated in various Canadian industries by the **forestry activity** of a province is revealing (Fig. 1). First, the **forest industry** that generally contributes the least to the GDP of a province is logging (except for Newfoundland and New Brunswick), whereas the greatest contributor is "paper and allied products industries" (except for Alberta and British Columbia).

Because logging and wood industries are labor intensive, while paper and allied products industries are capital intensive, the impact on employment is somewhat different from the impact on the GDP. In general, the impact on employment is relatively lower in paper and allied products industries, whereas the reverse is true for logging and wood industries (Figs. 1 and 2).

It is noteworthy that **forestry activity** generates 1.4 to 2.4 times more activity in other sectors of the economy than in **forest industries**. This difference in spin-off effect between provinces is attributable to the industrial diversity of the provinces and their neighbors. The three most populated provinces, Quebec, Ontario, and British Columbia, which also have a broader industrial base, appropriate a larger share of the spin-off effects of their **forestry activity** and an equally large share of the spin-off effects of the **forestry activity** of their neighboring provinces. In observing the impact of **forestry activity** on sectors other than **forest industries**, it may be noted that for these three provinces, the impact within the province is larger than that outside, whereas the reverse is true for the seven other provinces. Moreover, for neighboring provinces (New Brunswick, Manitoba, and Alberta) the impact on other provinces is relatively high, indicating that the provinces with a diverse industrial base appropriate the spin-off effect from less diversified neighboring provinces. Finally, for a province such as Newfoundland, which has very little industrial diversification and is far from the populated provinces, spin-off effects on other sectors are relatively small.

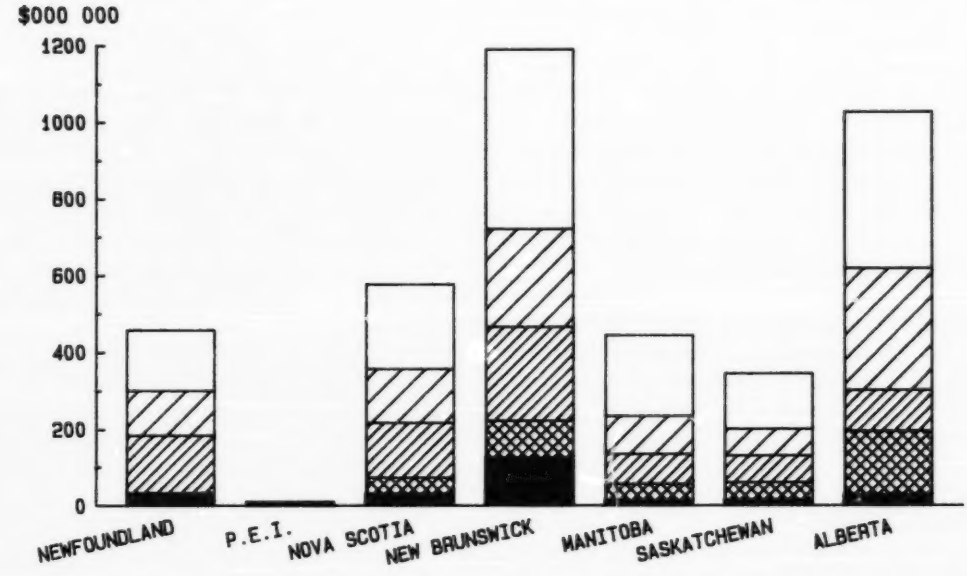
Importance of Forestry Activity for the Provinces

Let us consider only the impact on a given province of its own **forestry activity**. Table 3 compares this impact with the economy of the province. Aside from Prince Edward Island, the **forestry activity** of the provinces generates sufficient spin-off effect to play a significant role in the economy of each province. This role is important for the Maritimes and Quebec, and is absolutely vital in New Brunswick and British Columbia. In the case of British Columbia, 25.5% of the GDP and 17.5% of jobs depend on the spin-off effects from the provinces' **forestry activity**.

Employment Ratio (or Employment Multiplier)

The input-output model answers this question: for each job generated in the **forest industries**, how many jobs are generated in other sectors of the economy? Our simulations made possible a direct answer to this question for 1979. Assuming no significant change in economic structure between 1979 and the year of study, one can use the 1979 employment ratio to approximate the number of jobs in other sectors generated by **forestry activity** in the year of study.

The employment ratio (also called employment multiplier) is estimated by dividing the number of jobs generated in other sectors of the economy by the number of jobs generated in **forest industries**. Table 4 estimates the provincial employment ratio, which is limited to the spin-off effects on the province, and the national employment ratio which takes into account spin-off effects on other provinces. Table 4 indicates, for one job in the **forest industries** of a province, how many jobs depend



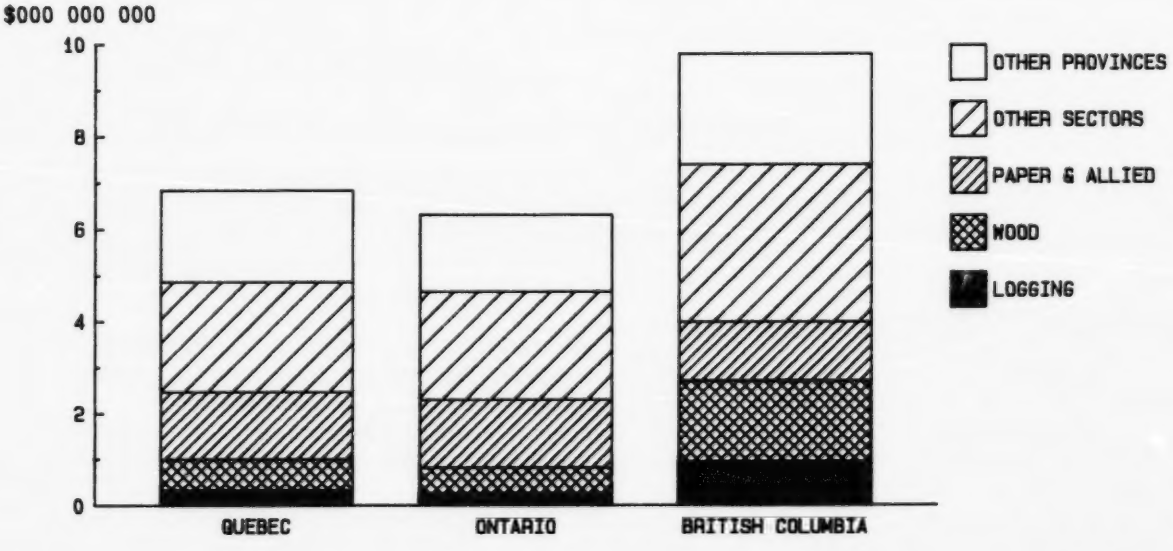


Figure 1. Total impact of forestry activity on gross domestic product (GDP).

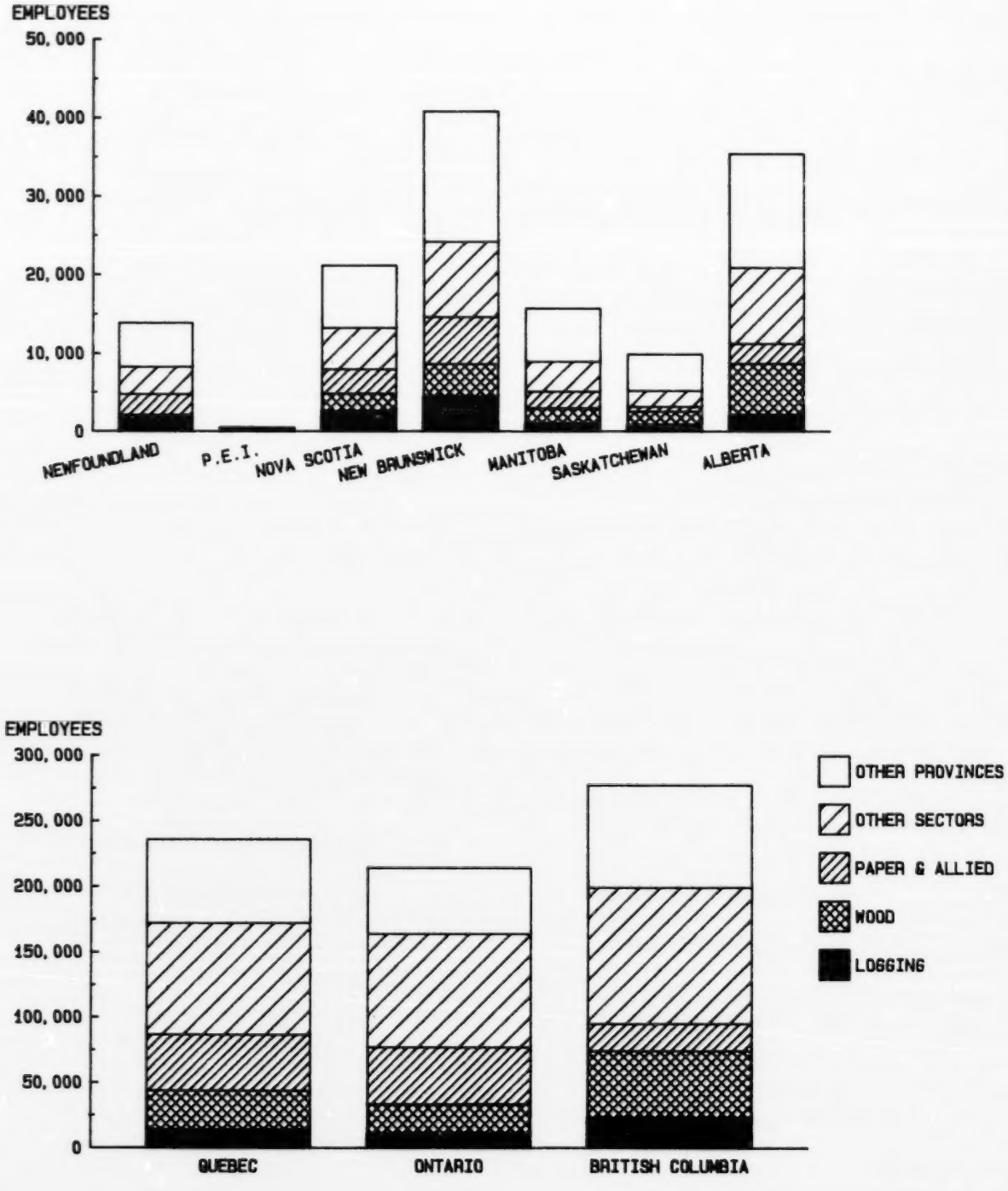


Figure 2. Total impact of forestry activity on employment.

Table 3. Contribution of forestry activity to the economy of each province (percentage of total activity) in 1979

Province	GDP at factor cost			Jobs		
	Forest industries	Other sectors	All sectors	Forest industries	Other sectors	All sectors
Newfoundland	5.6	3.5	9.1	2.9	2.1	5.0
Prince Edward Island	0.3	0.4	0.7	0.4	0.2	0.6
Nova Scotia	3.8	2.4	6.2	2.6	1.7	4.3
New Brunswick	10.2	5.6	15.8	6.1	3.9	10.0
Quebec	4.5	4.3	8.8	3.3	3.3	6.6
Ontario	2.6	2.6	5.2	1.9	12.2	4.1
Manitoba	1.5	1.1	2.6	1.2	0.8	2.0
Saskatchewan	1.3	0.7	2.0	0.8	0.5	1.3
Alberta	1.0	1.0	2.0	1.1	1.0	2.1
British Columbia	13.8	11.7	25.5	8.4	9.1	17.5

Results of simulations compared with the GDP of the province (Statistics Canada, catalogue no. 13-213) and the total number of jobs (Statistics Canada, catalogue no. 72-201).

Table 4. Employment ratio (other sectors/forest industries of the province) in 1979

Province	Other sectors		
	of the province	of other provinces	of the country
Newfoundland	0.7	1.2	1.9
Prince Edward Island	0.6	1.9	2.5
Nova Scotia	0.7	0.9	1.6
New Brunswick	0.7	1.1	1.8
Quebec	1.0	0.7	1.7
Ontario	1.1	0.7	1.8
Manitoba	0.7	1.3	2.0
Saskatchewan	0.6	1.4	2.0
Alberta	0.9	1.2	2.1
British Columbia	1.1	0.8	1.9

on **forestry activity** in the other sectors of the provincial economy, of the economy of other provinces, and of the national economy.

The number of jobs generated by **forestry activity** in other sectors of the economy can be approximated by multiplying these ratios by the number of jobs in **forest industries**. We can, for example, use the number of jobs in **forest industries** in 1984 to determine the spin-off effects on other sectors in the province and in other provinces (Table 5).

Table 5. Estimated number of jobs dependent on forestry activity in 1984 (jobs in 1984 forest industries × 1979 employment ratio)

Province	Forest industries in the province[a]	Other industries in the province[b]	All industries in other provinces[b]	National total[b]
Newfoundland	3 921[c]	2 740	4 710	11 370
Prince Edward Island	230	140	440	810
Nova Scotia	5 988	4 190	5 390	15 570
New Brunswick	13 188	9 230	14 510	36 930
Quebec	80 161	80 160	56 110	216 440
Ontario	71 356	78 490	49 950	199 800
Manitoba	4 377	3 060	5 690	13 130
Saskatchewan	2 535[c]	1 520	3 550	7 610
Alberta	8 525	7 670	10 230	26 430
British Columbia	78 134	85 950	62 510	226 590

[a]Census of Manufacturers, Statistics Canada, catalogue no. 25-202.

[b]Estimates prepared using employment ratios in Table 4.

[c]Estimate made using logging and wood industry jobs in 1984 and paper and allied products industry jobs in Newfoundland and Saskatchewan distributed between the two provinces according to their relative number of jobs in the 1979 intersectoral model.

Impact per Harvest Volume

Expressing the total impacts on a per unit of harvest volume basis identifies the economic repercussions of the timber supply in each province. There are substantial differences among provinces in the jobs and income created by a given volume of harvest (Figs. 3 and 4).

At first glance, two results attract attention. First is the very strong performance by Ontario, which obtained the highest self-impact per unit or volume harvested and the second highest impact on other provinces. Second, British Columbia performed poorly, although nearly half of Canada's total harvest comes from this province.

Ontario's strong performance is attributable partly to the diversity of its industrial base, enabling that province to appropriate a larger share of the spin-off effects of **forestry activity**. Another reason why Ontario has the largest **forestry activity** impact per unit of volume harvest is that many of the **forest products** processed in Ontario do not come from Ontario forests, but are imported from other provinces in the form of intermediate goods. Ontario **forest industries**, in a larger proportion than those of other provinces, import roundwood, pulp, paper, and wood for processing to a subsequent stage of production. This procedure generates jobs and revenue (GDP) that is unrelated to the volume of harvest in the province.

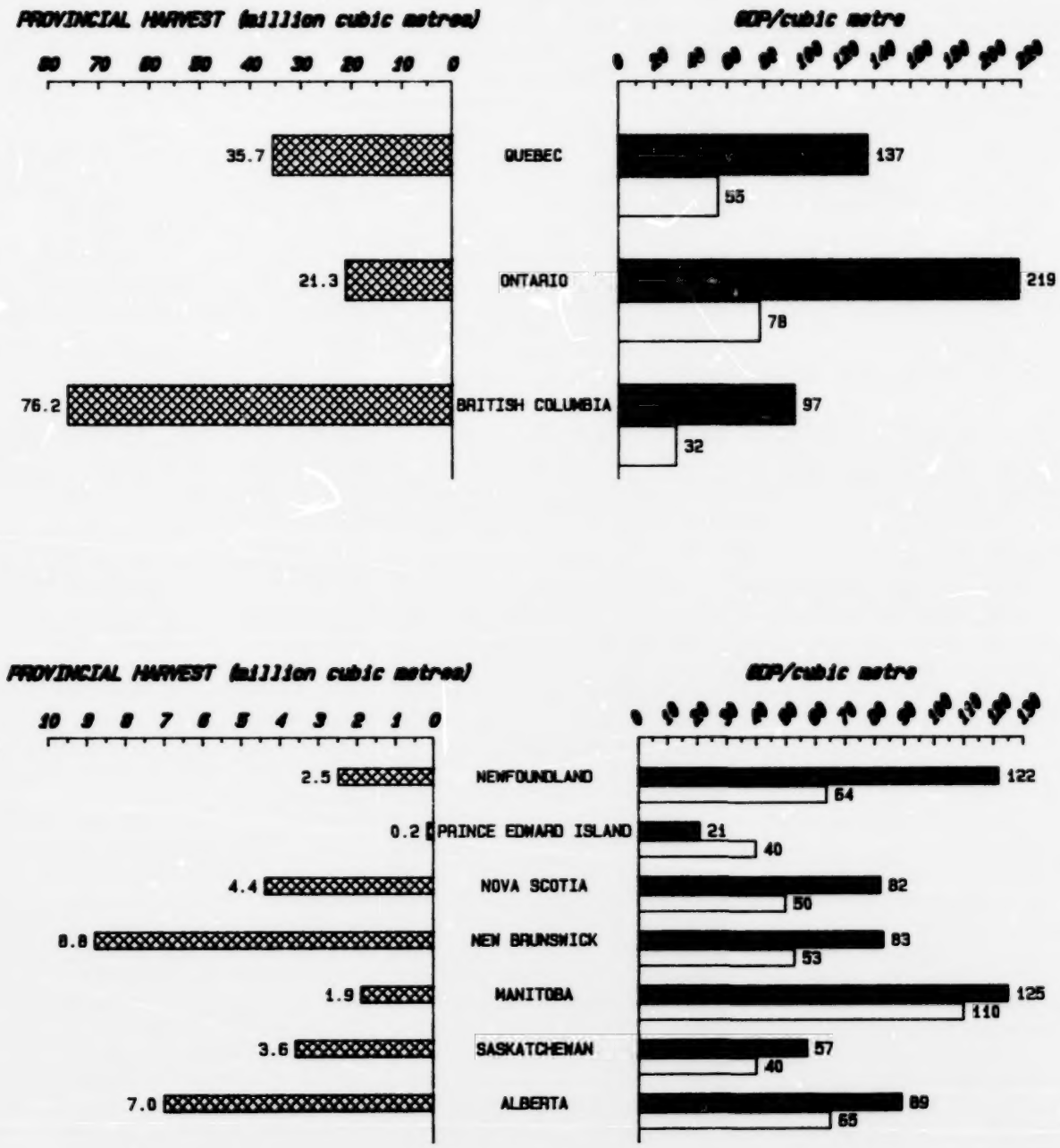


Figure 3. Harvest and impact on GDP by unit of volume harvested in province (black) and in other provinces (white).

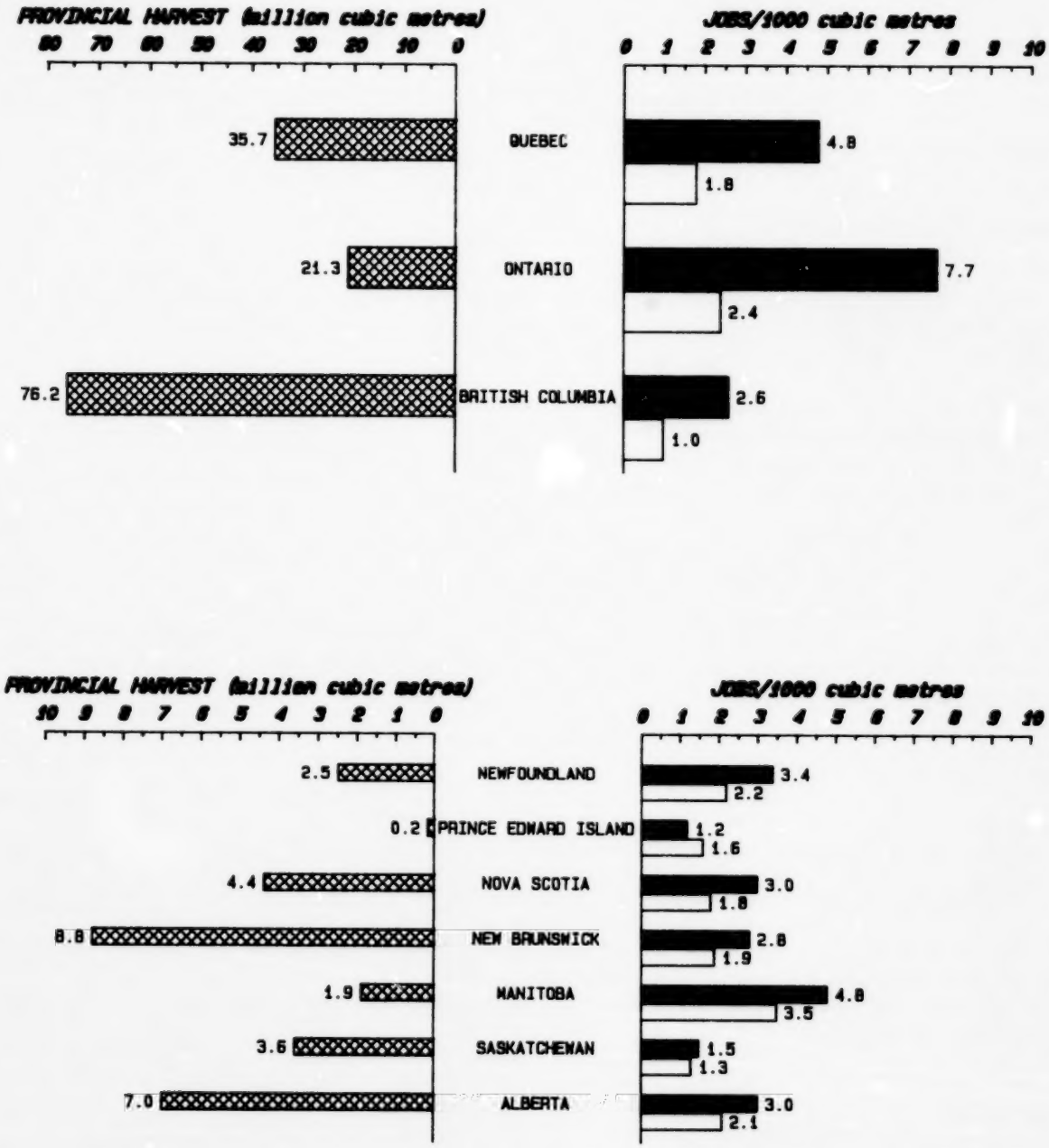


Figure 4. Harvest and impact on employment by unit of volume harvested in province (black) and in other provinces (white).

Two reasons might explain British Columbia's relatively poor performance. First, unlike the majority of provinces, British Columbia's wood industry is larger than its paper and allied industry. Wood industries are known to produce less value added for a given volume of wood than the paper and allied industries, therefore the impact per volume of wood harvested will be lower when the wood industry sector is predominant. Second, British Columbia exports **forest products** at low value added compared with other provinces (pulp instead of paper, lumber instead of sash and door).

In general, provinces that do more processing of their raw materials will have a greater impact per volume of harvest. Moreover, the paper and allied products industries seem to entail a greater impact than the wood industries.

Impact by Demand Category

As we mentioned at the start of this report, economic activity is generated by demand. The purpose of this section is to estimate the proportion of **forestry activity** in a province dependent on its own demand, on the demand of other provinces, and the demand of foreign countries for its **forest products**.

Figure 5 shows that foreign demand (exports) is the demand category with the greatest spin-off effect for 6 of the 10 provinces (Newfoundland, Nova Scotia, New Brunswick, Quebec, Saskatchewan, and British Columbia). Only Manitoba's **forestry activity** is more dependent on demand from other provinces than on other types of demand, whereas **forestry activities** in the remaining three provinces (Prince Edward Island, Ontario, and Alberta) depend more on their own demand for **forest products**.

NATIONAL MODEL RESULTS

This section summarizes the results at the national level. Readers interested in the impact of **forestry activity** at the provincial level should consult the preceding section, since provincial results can vary from the national average.

Impact on Canadian Forest Industries

As in the provincial case, to determine the validity of the model, estimated production levels[3] from model simulations were compared against actual observed production levels. This was done for 11 **forest industries** given in the Census of Manufacturers (see Table 6).

On the average, our simulations yield results 8.5% below those of the census. We feel that this estimating error will not affect the calculation of employment multipliers, but could be important in terms of absolute figures. The reader should thus consider absolute figures as minimums. For example, our simulation estimated that in 1980, 766 784 jobs in Canada would depend on **forestry activity**. This figure is underestimated by about 8% for 1980. A more correct estimate is made in the following subsection.

As explained for the provincial results, the underestimation of results is largely attributable to the fact that the simulation focused only on **forest products**, whereas **forest industries** also produce other products (accounting, however, for only a small percentage of their total production).

The underestimate is larger for sawmills and the pulp and paper industry, and even larger for

[3]Production = deliveries + inventory changes.

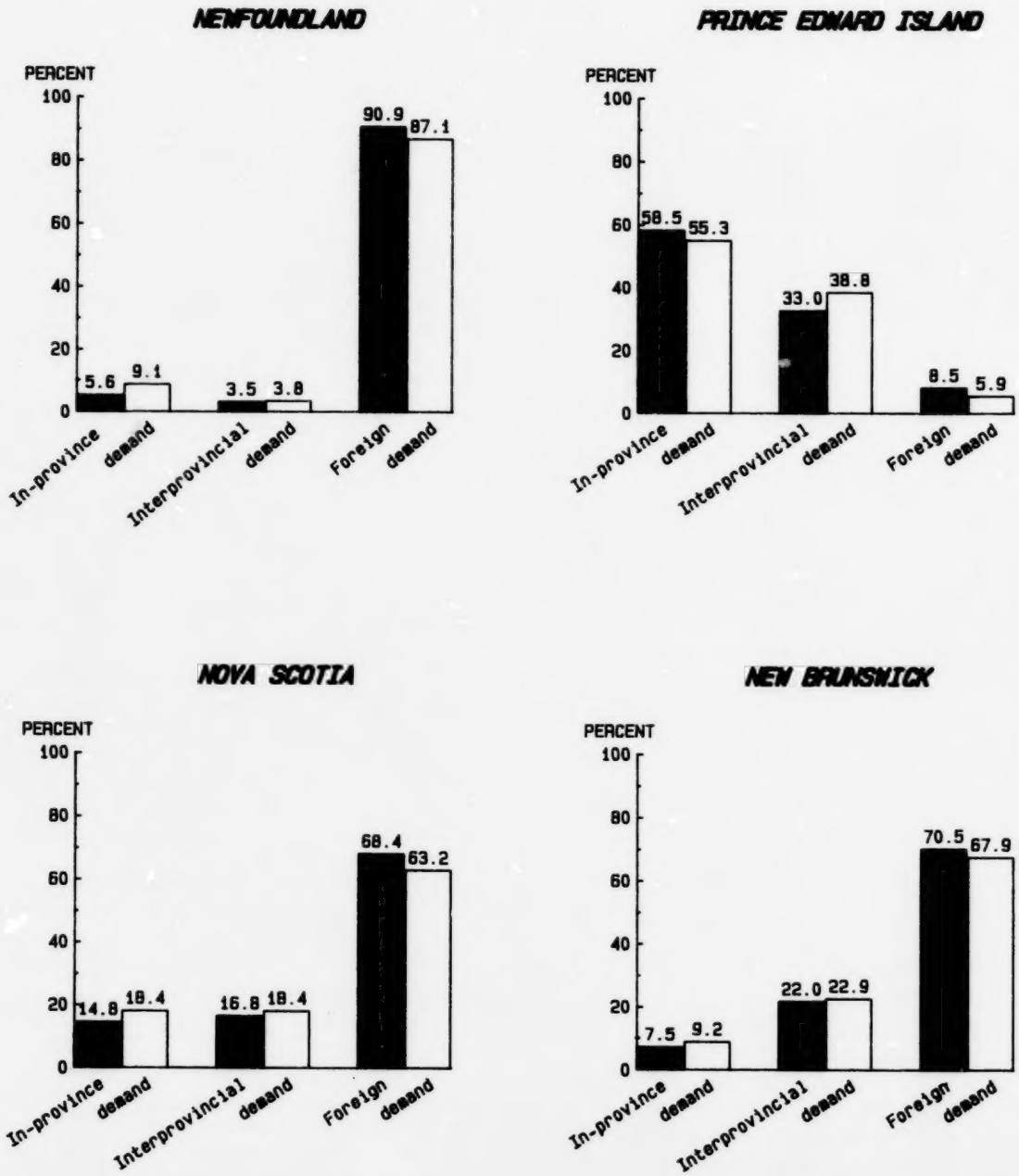


Figure 5. Composite impact on GDP (black) and on employment (white) by demand categories. (*Continued on p. 14*)

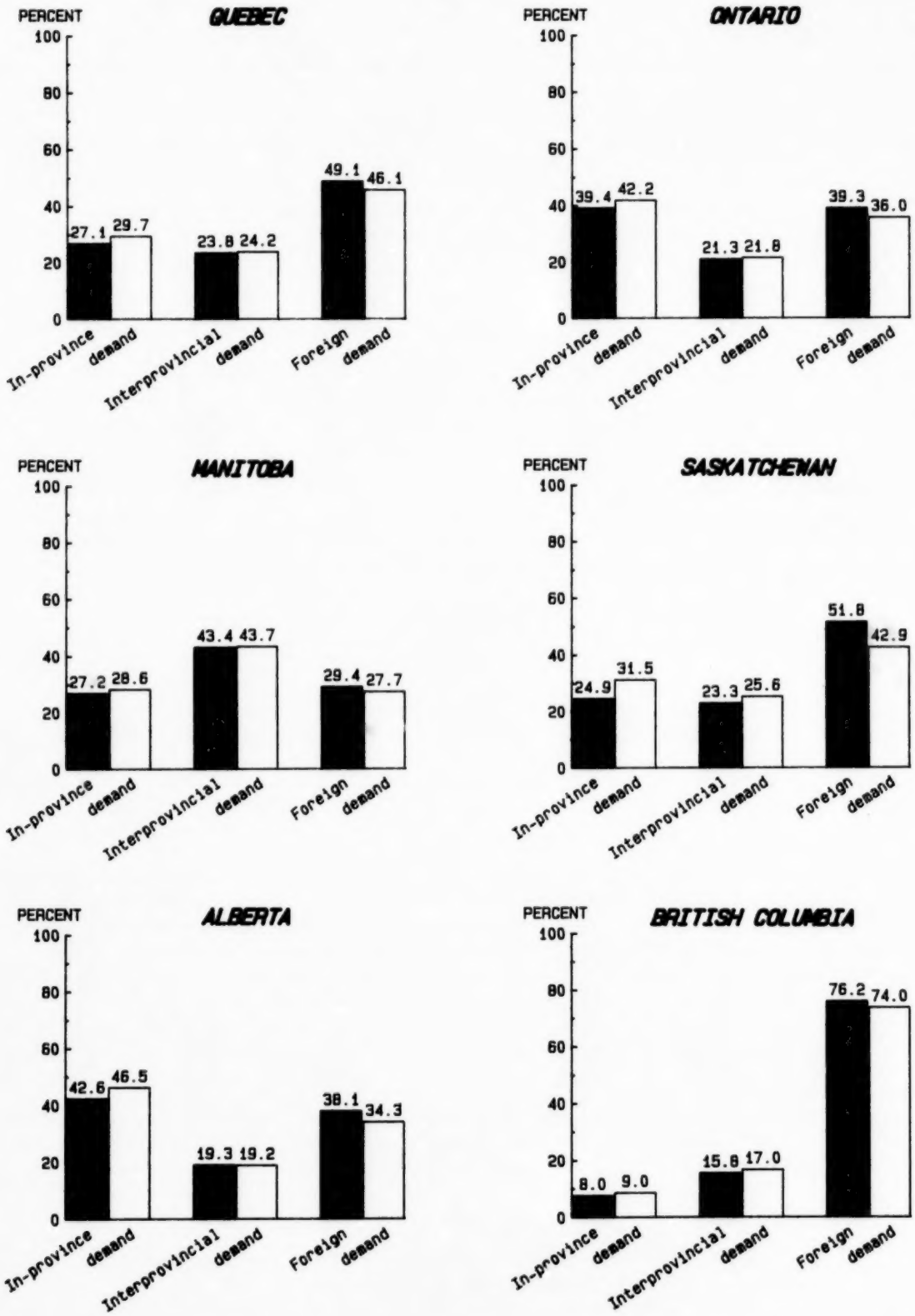


Figure 5. Composite impact on GDP (black) and on employment (white) by demand categories. (*Concluded*)

Table 6. Comparison between the production results of simulations and the Census of Manufacturers in 1980

	Simulation	Census of Manufacturers	Difference in percent
	($000 000)		
Logging	3 967.3	4 589.4	-13.5
Sawmills	4 780.2	5 357.8	-10.8
Veneer and plywood industries	819.5	839.3	-2.4
Sash, door, and other millwork industries	1 362.0	1 427.4	-4.6
Wooden box industries	177.6	188.8	-5.9
Coffin industries	33.8	32.0	+5.6
Other wood industries	424.4	481.0	-11.8
Pulp and paper mills	10 197.8	10 982.8	-7.1
Asphalt roofing industry	227.1	243.4	-6.7
Paper box and bag industries	2 015.7	2 012.8	+0.1
Other converted paper products industries	1 175.1	1 356.2	-13.4
Total forest industries	25 180.5	27 510.9	-8.5

logging. This is due to the manner in which simulations are made. The initial impact is felt by top-line **forest products**, then is reflected through the demand for intermediate goods on industries downstream in the processing sector. If **forest industries** also produce non-forest products, their production level and, consequently, their demand for nonprocessed **forest products** will be underestimated accordingly. This underestimation of nonprocessed forest product demand will tend to accumulate as one moves back down the chain of forest product processing. For this reason, underestimates are more significant in the primary logging industry than in conversion industries such as sashes and doors.

Impact on All Sectors of the Canadian Economy

Our simulations estimate that in 1980, $25.8 billion[4] of the GDP at factor cost was generated by processing of the forest into **forest products**; this represented 9.3% of the collective revenue of Canadians. From this, $10.7 billion was generated in the **forest industries**, whereas the rest of the impact was spread among the 180 other sectors of the economy, chief among which were (by order of importance): retailing ($1. 6 billion), wholesaling ($1.2 billion), and insurance companies ($1.1 billion).

The impact on employment is also significant. While there were 302 000 jobs in the **forest industries** in 1980, we estimated that 532 000 jobs in other sectors depended on **forestry activity**, including 121 000 in the retail sector alone. In all, 834 000 jobs were generated by the **forest industry**, or 7.8% of all jobs in Canada.

National Employment Ratio

The employment ratio is obtained by dividing the number of jobs generated by **forestry activity** in non-forest sectors by the number of jobs in forest sectors. The ratio indicates how many jobs are generated in non-forest sectors for each job generated in **forest industries**. In 1980, this ratio was 1.76. In other words, for each job in a forest sector, there were 1.76 jobs generated in forest sector suppliers and in industries meeting the consumer needs of forest sector workers.

Assuming that Canada's industrial structure has not changed significantly since 1980, it is possible to estimate how many jobs depended on **forestry activity** in 1984 by estimating the number of jobs in non-forest sectors and multiplying the employment ratio by the number of jobs in the **forest industry** in 1984 (Table 7).

In 1984, therefore, there were approximately 740 000 jobs dependent on **forestry activity**, or 6.7% of all jobs in Canada. Thus, the loss of about 34 000 jobs in **forest industries** between 1980 and 1984 led to an estimated loss of 60 000 more jobs in other sectors of the economy, resulting in a significant decline in the importance of **forestry activity** for the Canadian economy.

Impact per Harvest Volume

The purpose of this subsection is to estimate the number of jobs and the revenue (GDP at factor cost) derived by Canada from each 1000 m^3 of wood harvested.

If it is assumed that imports of roundwood or partially processed wood are negligible, the impact per unit of harvest volume presented in Table 8 may be calculated simply by dividing the total impact by the volume harvested. Thus, each 1000 m^3 of harvested wood generated $166 000 of revenue on the average, when converted into **forest products**, and created slightly more than five jobs, including nearly two in the forest sectors.

Impact by Demand Category

One of our simulations makes it possible to estimate the importance of foreign markets for **forestry activity** in Canada. It shows that 62% of jobs and 67% of revenue (GDP at factor cost)

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[4] The figures in this subsection are from Table C7 (Appendix C - results of simulations) multiplied by 1.085 to take into account the underestimate discussed previously.

Table 7. Estimated number of jobs dependent on forestry activity in 1984

Number of jobs in forest sectors in 1984		Number of jobs in non-forest sectors		Estimated total number of jobs
268 422[a]	+	472 423 (268 422 × 1.76)	=	740 845

[a]Census of Manufacturers, Statistics Canada, catalogue no. 25- 202.

Table 8. Impact on employment and the GDP at factor cost per 1000 m^3 of harvested wood[a]

	Job/1000 m^3	GDP($)/1000 m^3
Forest industries	1.94	68.9
Other sectors	3.42	97.2
Total	5.36	166.1

[a]The roundwood harvest totaled 155 380 000 m^3 in 1980 (Statistics Canada, catalogue no. 25-201).

generated by **forestry activity** came from forest product exports. In 1980, 520 000 jobs and about $17 billion in revenue depended on the sale of **forest products** abroad.

It is noteworthy that the impact of exports is concentrated in the three main **forest industries**: logging, sawmills, and pulp and paper. Other **forestry industries** depend more on the Canadian domestic market.

Incredibly, 83% of logging production is dependent on exports, although less than 2% of roundwood crosses the border; however, roundwood is an intermediate good that is consumed by industries that are heavily geared toward foreign markets (that is, sawmills and pulp and paper). Table 9 shows that 89% of sawmill production and 82% of pulp and paper production is for export. It is therefore not surprising that logging production, which is largely directed toward these two industries, is also export-dependent.

The 89 and 82% figures for sawmills and pulp and paper, respectively, may seem high. These industries do not export this percentage of their production directly, but a significant proportion of their production is processed in other industries and subsequently exported. For example, in 1980, 69% of the production of sawmills was exported directly[5] (65% in the form of lumber, 4% in various forms of **forest products**). An additional 20%, however, was exported after processing (14% in the form of roundwood, chips, and residue sold to the pulp and paper industry, 4% in the form of wood processed into sashes and doors, and 2% in various forms of other processed **forest products**). The addition of the 69% direct exports and the 20% of sawmill products sold to other industries for subsequent export means that 89% of sawmill activity is dependent on exports.

[5]Source: 1980 national input-output model.

Table 9. Importance of exports for each Canadian forest industry in 1980

	Total production[a] ($000 000 000)	Exports[b] (%)
Logging	4.6	83
Sawmills	5.4	89
Veneer and plywood industries	0.8	35
Sash, door, and other millwork industries	1.4	15
Wooden box industries	0.2	20
Coffin industries	0.03	6
Other wood industries	0.5	70
Pulp and paper mills	11.0	82
Asphalt roofing industry	0.2	27
Paper box and bag industries	2.0	4
Other converted paper products industries	1.4	13
Total forest industries	27.5	68

[a]Census of Manufacturers.
[b]In Appendix C, Table C9 divided by Table C8.

Indirect Effect and Induced Effect

In the introduction, we mentioned that a **forest industry** has two types of spin-off effects. There is a spin-off effect on the suppliers of **forest industries** (called the **indirect effect**), and there is a spin-off effect when workers spend their salaries to buy consumer goods (called the **induced effect**). Tables 7 and 8 of Appendix C establish the difference between these two effects. Of the $31 billion in spin-off effect on the production of non-forest industries, $13 billion was indirect (43%) and $18 billion (57%) was induced. The **induced effect** was relatively more important in terms of employment, with 68% of jobs being linked to **induced effects**, compared with 32% for **indirect effects**. **Induced effects** accounted for 61% of revenue (GDP at factor cost), whereas **indirect effects** accounted for 39%.

CONCLUSION

To properly interpret the results of our simulations, readers should consider two criticisms commonly applied to input-output models. The first is that the matrix of technical coefficients is constructed to calculate the average impact of a final demand and not its marginal impact. Although it is generally believed that input demands per output unit (technical coefficients) vary according to the level of production, the model keeps them fixed. Accordingly, results should be considered as the average events for the year of simulation, and not the marginal occurrences for the last unit produced. For example, it should not be claimed that an additional job in the **forest industries** will

create 1.76 jobs in other sectors, but that in 1980, an average of 1.76 jobs in other sectors depended on **forestry activity** for each job in the **forest industries**.

Another criticism often leveled at input-output models is that it is impossible to determine how long spin-off effects will take after the initial impact. We know that the **direct effect** generates an initial **indirect effect**, that this initial **indirect effect** in turn generates a second **indirect effect**, and so on until the cumulative drain renders effects negligible. We do not know how much time these various impacts will take. Based on the results of models, it can be stated, for example, that **forestry activity** in 1984 generated approximately 740 000 jobs; however, it is not known when these jobs were effectively generated.

Despite these limitations, intersectoral models constitute an analytical tool offering a wealth of information; to our knowledge, no other model presents such detailed results. More specifically, interprovincial trade matrixes make it possible for the interprovincial model to link the impact of economic activity in one province with the others, which cannot be done as accurately with another model.

In this study, we have tried to assess the contribution made by **forestry activity** to the economy of Canada and its provinces. By means of simulation, we have estimated the production effort in all sectors of the economy necessary to meet the **forest product** demand.

Conversely, this overall approach does not make possible comparison between the **forest industries**. It is thus impossible to determine which **forest industry** has the greatest spin-off effect on other sectors of the economy, or which **forest industry** generated the greatest economic fall-out from the same harvest volume. To answer these questions, simulations would have to be run on each **forest industry** instead of for the entire sector; this is perhaps a useful extension for a later study.

GLOSSARY

Closed model: A model that estimates the direct, indirect, and induced effects of the production of certain goods. Leakages in the closed model are imports and payment of the capital of major corporations. Unlike the open model, wages and the monies paid to small owners are reinjected after subtracting a mean savings rate.

Direct effect: The distribution of the initial impact of a demand for certain goods on goods, primary factors (labor, capital), and sectors. The sum of direct effects is always equal to the initial impact of the simulation (final demand).

Forest industries (or forest sector): The industries that process products containing a significant amount of wood or wood fiber. According to the Statistics Canada classification of economic activities, they are the following "two-digit" industries: logging, wood industries, and paper and allied products industries. The wood industry group is itself divided into "three-digit" industries: sawmill, planing mill, and shingle mill products industries; veneer plywood industries; sash, door, and other millwork industries; wooden box industries; coffin industries; and other wood industries. The paper and allied products group is divided as follows: pulp and paper industries; asphalt roofing industry; paper box and bag industries; and other converted paper products industries.

Forest products: For the purposes of this study, the numbers preceding forest products in the input-output model:

24. logs and bolts
25. poles, pit props., fence posts
26. pulpwood
27. other crude wood materials
28. pasturage in forests - custom forestry
190. pulpwood chips
191. lumber and timber
192. railway ties
193. wood waste
194. custom woodwork and millwork
195. veneer and plywood
196. millwork
197. fabricated wood for structures
198. prefabricated wood structures
199. wood containers and pallets
200. caskets, other morticians' goods
201. wood-fabricated materials NES
202. wood barrels and kegs
203. wood endproducts NES
209. wood pulp
210. newsprint
211. other printing paper
212. fine paper
213. tissue and sanitary paper
214. wrapping paper
215. paperboard
216. building paper and board
217. towels, napkins, and toilet paper
218. vanillin
219. paper materials, by-products NES
220. flooring, vinyl-asbestos
221. paper cartons, bags, cans, and bottles

222. paper, gummed, waxed or printed
223. converted aluminum foil
224. facial tissues and sanitary napkins
225. paper containers NES
226. office and stationery supplies
227. paper end-products NES

Forestry activity: For the purposes of this study, economic activity generated by processing of the forest into forest products. Such economic activity may be generated in all sectors of the economy, although it is generally concentrated in forest industries. Economic activity is measured in terms of number of jobs or in value added.
Indirect effect: The spin-off effect of the demand for intermediate goods. It is estimated using an open model.
Induced effect: The spin-off effect of spending by salaried workers employed in the production of the final or intermediate goods in the simulation. The amount spent by workers should be equal to their wages, minus an average rate of savings.
Open model: A model that estimates the direct and indirect effects of the production of certain goods. Leakages in the open model are imports and the payment of primary factors.
Total effect: For the purposes of this study, the sum of the direct, indirect, and induced effects.

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APPENDIX A. DETAILED OPERATION OF THE MODEL

The following discussion is based on three hypotheses of the Statistics Canada rectangular input-output model. The first assumes that all production of goods and services is always distributed in the same manner in all industries. This distribution is effected by means of the market share matrix, the elements of which are constant for all levels of production. Specifically, this notion is expressed as follows:

$$g = Dq \tag{1}$$

where g is a vector whose elements represent the level of production in value of each industry.
D is the market share matrix in which the intersection of line i and column j represents the sales figure in dollars of industry i per production dollar of good or service j.
q is a vector whose elements represent the level of production in value of each good or service.

The second hypothesis assumes that the relation between the production level of an industry and that industry's demand level for intermediate products is constant. The demand for intermediate products is disseminated through the technical coefficients matrix. These coefficients are fixed for all production levels; in other words, regardless of the production level in a simulation, the relationship between each of the inputs of an industry is always the same. Marginal productivities are thus termed to be constant, and production functions are described as linear and homogeneous. Formally, this hypothesis means that:

$$Ui = Bg \tag{2}$$

where U is the intermediate goods and services demand in value matrix, the intersection of line i and column j being the demand for goods or service i by industry j.
i is a line aggregate vector.
B is the technical coefficients matrix, the intersection of line i and column j of which represents the purchase in dollars of intermediate goods or service i per dollar of production by industry j.

The third hypothesis is an equivalent of the second for primary production factors (capital and work). The demand for primary factors per industry therefore depends, much like the demand for intermediate goods and services, on the given industry's level of production:

$$n = Cg + yf \tag{3}$$

where n is a vector whose elements represent the demand of each of the primary factors.
C is the technical coefficients matrix for primary factors, the intersection of line i and column j of which represents the demand in dollars of factor i for the production level in dollars of industry j.
yf is the primary production factors final demand vector.

Separate demand into two components: intermediate demand and final demand. Intermediate demand is the demand for goods or services by industries that need input to produce. Final demand is the demand for goods that will undergo no further processing before they are consumed or leave the area of study; such goods are destined for consumers, governments, investment or export markets.

Assuming that the supply of a product equals its demand or, if one prefers, that there is a balance of transactions involving goods, one can write:

$$q = Bg + f \tag{4}$$

where f is the vector of final demand, the elements of which represent the total final demand for each of the goods.

Through equal substitution from the first equation, the following results:

$$g = D(Bg + f)$$

or

$$g = [(I - DB)^{-1} D]f \tag{5}$$

where I is an identity matrix. Equation (5) defines the level of production per industry as a linear conversion of final demand. It is possible to determine for each industry what level of activity is required to meet a given final demand. To do so, we postmultiply the final demand vector by the term set in brackets, which we refer to as the impact matrix. This matrix being constant, since it is made up of market share and technical coefficient matrixes that are themselves constant, the conversion is clearly linear.

Based on equations (4) and (5), we obtain:

$$q = B((I - DB)^{-1} D) f + f$$

or

$$q = [B(I - DB)^{-1} D + I]f \tag{6}$$

This equation defines the linear conversion of final demand in terms of production level for each of the goods and services. It is therefore possible, by premultiplying the final demand by this second impact matrix (the term in square brackets), to determine the production level of goods and services necessary to meet the final demand. From equations (3) and (5), we obtain:

$$n = C((i - DB)^{-1} Df) + yf$$

or

$$n = [C(I - DB)^{-1} D] f + yf \tag{7}$$

This last equation defines the linear conversion of final demand in terms of the use of primary factors needed to meet this final demand. We can thus determine the level of use of primary factors in each industry by premultiplying the final demand for goods and services by the third impact matrix (the term in brackets) and subsequently adding the final demand for primary factors.

Equations (5), (6), and (7) show how the model calculates the level of activity of industries, the production level of goods and services, and finally the level of use of primary factors that must be attained to meet a given final demand. These calculations rest on impact matrixes that are themselves calculated from the technical coefficients matrix and the market share matrix.

APPENDIX B. SIMULATIONS

As shown in the previous appendix, the production of goods and services may be expressed as a linear conversion of final demand (see equation 6). For a given final demand, the model evaluates the associated intermediate demand and adds it to the final demand to obtain the total demand for each of the goods and services. The total demand is of course equal to production plus imports.

To illustrate this, assume that the final demand consists of a single product, newsprint, and that the value of this final demand is equal to the production level of 1980. A simulation using this final demand would give the total demand for each of the goods and services necessary to the production of the said newsprint,[6] that is, not only the inputs necessary for newsprint production, but also inputs necessary for the production of such inputs. It would thus yield a production level evaluation of each of the 595 goods and services necessary to manufacture newsprint in 1980.

In input-output model terminology, this production is called the **indirect effect**. One could estimate the **indirect effect** of manufacturing each forest product. However, in attempting to estimate the **indirect effect** of forest product processing activity as a whole, one cannot use in a simulation a final demand made up of the total production of all **forest products** because such use would involve double counting.

A significant proportion of pulpwood demand is already estimated in calculating the spin-off effects of newsprint; we therefore cannot add the entire pulpwood production to this spin-off effect without counting the same production twice. The solution is to subtract from pulpwood production the intermediate demand for pulpwood by newsprint producers. The final demand, which serves as a starting point for our simulation, would thus comprise all newsprint production and the pulpwood production not used in the manufacture of newsprint. The model would calculate the intermediate demand (**indirect effect**) necessary to manufacture this final demand, so as to obtain the results of the simulation by adding the intermediate demand to the final demand.

We could repeat this example for all **forest products** that serve as intermediate goods in the **forest industry**. This is why the final demand used as the point of departure in our first and third simulations is the forest product production minus the intermediate demand for these products by **forest industries** (the detailed breakdown of the final demand vector is available on request).

Anyone familiar with the intersectoral model will know that this approach is not without shortcomings. The spin-off effect that makes it possible to evaluate intermediate demand will be underestimated if **forest industries** produce non-forest products. Let us assume, for example, that newsprint producers sell electricity to neighboring companies, and that the monies thus made represent 5% of their total sales. In the simulation, only their newsprint production will be required (that is, 95% of their total production). In calculating the spin-off effects, the model will simulate only a 95% demand for each of the inputs required by newsprint producers. Therefore, only 95% of the intermediate pulpwood demand of newsprint producers will be calculated, thereby underestimating the pulpwood demand. This underestimate depends on the relative importance of the intermediate goods and the importance of non-forest product production for **forest industries**. Fortunately, non-forest products account for only a small share of **forest industry** sales – so small, in fact, that any underestimates caused by this should not exceed 5%.

The second simulation, which evaluates the impact of forest product exports on the Canadian economy, does not suffer from this underestimate. The approach consists of considering only the exports of each forest product. The model calculates the **indirect effects** (or spin-off effects) that these exports have on all sectors of the economy.

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[6]The Canadian Forestry Service has published two reports on this type of impact for major forest products. These reports use the 1960 and 1965 models and were written by Ruth Mayost under the title "The Impact of the Forestry Industry on the Canadian Economy."

Table C1. Impact by industry of forestry activity of a province on employment in 1979[a]

Province	Logging[b]	Wood industries[b]	Paper and allied industries[b]	Forest industries[b]	Other industries of the province	Total of the province	Other provinces	Total
Newfoundland	1 798.0	433.4	2 644.9	4 876.3	3 497.1	8 373.4	5 591.2	**13 964.6**
Prince Edward Island	1.8	173.2	0	175.0	96.6	271.6	343.1	**614.7**
Nova Scotia	2 789.6	2 184.1	3 108.6	8 082.3	5 262.3	13 344.6	7 891.9	**21 236.5**
New Brunswick	4 586.4	4 151.5	5 981.3	14 719.2	9 558.2	24 277.4	16 668.3	**40 945.7**
Quebec	14 852.1	29 510.2	42 828.5	87 190.8	85 378.2	172 569.0	63 519.1	**236 088.1**
Ontario	11 680.8	22 448.8	43 491.6	77 621.2	86 781.7	164 402.9	50 276.9	**214 679.8**
Manitoba	1 201.2	1 913.2	2 136.9	5 251.3	3 820.8	9 072.1	6 746.8	**15 818.9**
Saskatchewan	1 028.9	1 662.7	612.1	3 303.7	2 046.1	5 349.8	4 662.7	**10 012.5**
Alberta	2 304.1	6 500.5	2 550.3	11 354.9	9 624.0	20 978.9	14 515.1	**35 494.0**
British Columbia	23 480.1	51 284.2	20 912.4	95 676.7	104 006.7	199 683.4	77 990.5	**277 673.9**

[a]Unlike the results of the national model, these include only the employees.
[b]Estimated with revised employment ratios.

Table C2. Impact by industry of forest products exports of a province on employment in 1979[a]

Province	Logging[b]	Wood industries[b]	Paper and allied industries[b]	Forest industries[b]	Other industries of the province	Total of the province	Other provinces	Total
Newfoundland	1 718.7	32.8	2 459.6	4 211.1	3 083.7	7 294.8	4 596.0	**11 890.8**
Prince Edward Island	0	6.0	0	6.0	10.1	16.1	14.6	**30.7**
Nova Scotia	2 104.6	601.2	2 255.5	4 961.3	3 477.5	8 438.8	4 867.1	**13 305.9**
New Brunswick	3 320.6	1 960.9	4 613.3	9 894.8	6 587.8	16 482.6	11 262.2	**27 744.8**
Quebec	8 393.3	10 478.7	21 759.3	40 631.3	38 904.4	79 535.7	29 060.1	**108 595.8**
Ontario	5 974.6	7 783.9	15 178.6	28 937.1	30 192.0	59 129.1	17 545.0	**76 674.1**
Manitoba	647.6	335.0	463.6	1 446.2	1 062.6	2 508.8	1 454.0	**3 962.8**
Saskatchewan	540.4	451.2	378.6	1 370.2	925.5	2 295.7	2 042.6	**4 338.3**
Alberta	1 536.1	1 452.8	1 285.0	4 273.8	2 913.4	7 187.2	4 259.5	**11 446.7**
British Columbia	16 947.7	36 998.1	16 748.9	70 694.7	77 060.7	147 755.4	57 252.0	**205 007.4**

[a]Unlike the results of the national model, these include on. the employees.
[b]Estimated with revised employment ratios.

Table C3. Impact of forest products deliveries to other provinces on employment in 1979[a]

Province	Logging[b]	Wood industries[b]	Paper and allied industries[b]	Forest industries[b]	Other industries of the province	Total of the province	Other provinces	Total
Newfoundland	63.3	45.9	82.4	191.6	125.9	317.5	224.9	**542.4**
Prince Edward Island	0.1	78.2	0	78.3	27.0	105.3	147.5	**252.8**
Nova Scotia	343.8	625.4	586.2	1 555.4	893.2	2 448.6	1 484.8	**3 933.4**
New Brunswick	957.2	1 312.8	1 124.0	3 394.0	2 157.0	5 551.0	3 822.2	**9 373.2**
Quebec	3 838.1	7 222.6	9 986.8	21 047.5	20 715.7	41 763.2	15 380.8	**57 144.0**
Ontario	2 984.6	4 257.9	9 380.4	16 622.9	19 192.9	35 815.8	10 765.3	**46 581.1**
Manitoba	342.1	1 023.9	971.0	2 337.0	1 629.4	3 966.4	3 185.1	**7 151.5**
Saskatchewan	277.4	477.6	114.5	869.5	500.2	1 369.7	1 131.1	**2 500.8**
Alberta	240.9	1 741.3	247.7	2 229.9	1 800.9	4 030.8	3 276.9	**7 307.7**
British Columbia	4 815.9	9 458.2	2 152.4	16 426.5	17 507.7	33 934.2	13 480.6	**47 414.8**

[a]Unlike the results of the national model, these include only the employees.
[b]Estimated with revised employment ratios.

Table C4. Impact by industry of forestry activity of a province on the GDP at factor cost in 1979 ($000)

Province	Logging	Wood industries	Paper and allied industries	Forest industries	Other industries of the province	Total of the province	Other provinces	Total
Newfoundland	30 692	6 621	149 980	187 293	116 212	303 505	156 907	**460 412**
Prince Edward Island	31	1 834	0	1 865	2 820	4 685	9 017	**13 702**
Nova Scotia	34 693	42 482	142 803	219 978	139 716	359 694	219 862	**579 556**
New Brunswick	129 319	96 042	743 292	468 653	255 538	724 191	468 910	**1 193 101**
Quebec	359 987	670 699	1 456 675	2 487 361	2 390 595	4 877 956	1 979 302	**6 857 258**
Ontario	289 037	555 976	1 471 776	2 316 789	2 351 583	4 668 372	1 660 768	**6 329 140**
Manitoba	16 225	44 512	78 073	138 810	98 714	237 524	209 956	**447 480**
Saskatchewan	18 879	45 471	70 290	134 640	69 381	204 021	144 147	**348 168**
Alberta	30 983	167 378	106 628	304 989	316 397	621 346	409 113	**1 030 459**
British Columbia	975 704	1 750 611	1 279 116	4 005 431	3 409 572	7 415 003	2 397 272	**9 812 275**

Table C5. Impact by industry of forest products exports of a province on the GDP at factor cost in 1979 ($000)

Province	Logging	Wood industries	Papers and allied industries	Forest industries	Other industries of the province	Total of the province	Other provinces	Total
Newfoundland	29 327	569	142 530	172 426	103 332	275 758	129 714	**405 472**
Prince Edward Island	1	98	0	99	298	397	383	**780**
Nova Scotia	26 175	11 402	114 858	152 435	93 490	245 925	135 050	**380 975**
New Brunswick	93 629	45 776	192 858	332 263	178 070	510 333	317 950	**828 283**
Quebec	203 438	257 778	815 222	1 276 438	1 115 485	2 391 923	911 667	**3 303 590**
Ontario	147 837	209 703	635 451	992 991	842 379	1 835 370	600 424	**2 435 794**
Manitoba	8 747	10 235	22 078	41 060	28 628	69 688	45 363	**115 051**
Saskatchewan	9 915	11 261	52 510	73 686	31 960	105 646	64 073	**169 719**
Alberta	20 656	40 057	68 171	128 884	107 959	236 843	120 086	**356 929**
British Columbia	704 254	1 325 658	1 081 115	3 111 027	2 536 409	5 647 436	1 765 257	**7 412 693**

Table C6. Impact by industry of forest products deliveries to other provinces on the GDP at factor cost in 1979 ($000)

Province	Logging	Wood industries	Paper and allied industries	Forest industries	Other industries of the province	Total of the province	Other provinces	Total
Newfoundland	1 080	663	4 784	6 527	4 189	10 716	6 243	**16 959**
Prince Edward Island	1	779	0	780	765	1 545	3 562	**5 107**
Nova Scotia	4 275	12 174	20 477	36 926	23 633	60 559	41 609	**102 168**
New Brunswick	26 989	30 602	44 693	102 284	56 978	159 262	107 110	**266 372**
Quebec	93 029	166 037	328 472	587 538	575 425	1 162 963	478 664	**1 641 627**
Ontario	73 853	103 997	301 304	479 154	516 507	995 661	353 156	**1 348 817**
Manitoba	4 620	21 933	34 914	61 467	41 684	103 151	98 875	**202 026**
Saskatchewan	5 090	12 223	13 046	30 359	17 168	47 527	35 140	**82 667**
Alberta	3 239	45 981	9 370	58 590	61 099	119 689	91 526	**211 215**
British Columbia	200 125	281 435	110 836	592 396	578 635	1 171 031	411 790	**1 582 821**

Table C7. Total effects of forestry activity in Canada

Industries		Production ($000 000)	Jobs	GDP at factor cost ($000 000)
Forest industries				
2.	Logging	3 967.3	53 451	1 720.3
59.	Sawmills	4 780.2	58 605	1 635.6
60.	Veneer and plywood mills	819.5	11 738	278.6
61.	Sash, door, and planing mills	1 362.0	23 266	546.6
62.	Wooden box factories	177.6	3 357	70.4
63.	Coffin industry	33.8	857	14.3
64.	Miscellaneous wood industries	424.4	6 446	143.6
69.	Pulp and paper industry	10 197.8	78 964	4 383.1
70.	Asphalt and related products	227.1	1 235	68.5
71.	Paper box and bag manufacturers	2 015.7	25 431	632.4
72.	Other paper converters	1 175.1	14 274	371.9
Total forest industries		**25 180.5**	**277 624**	**9 865.3**
Selected industries				
1.	Agriculture	923.4	27 736	499.7
73.	Printing and publishing	487.0	8 965	245.7
138.	Repair construction	715.3	10 494	280.5
150.	Railway transport	385.8	7 217	222.6
151.	Truck transport	926.7	18 781	468.4
161.	Electricity	996.6	8 956	785.2
164.	Wholesale trade	1 581.7	35 731	1 068.2
165.	Retail trade	2 130.4	111 519	1 457.1
168.	Banks and credit unions	400.8	13 872	282.8
170.	Other financial institutions and real estate	1 732.1	18 264	1 025.0
176.	Professional services to business	245.9	12 632	187.0
183.	Misc. services to business	449.4	12 405	302.7
Total all sectors		**56 210.5**	**766 784**	**23 781.8**

Table C8. Direct and indirect effects of forestry activity in Canada

Industries		Production ($000 000)	Jobs	GDP at factor cost ($000 000)
Forest industries				
2.	Logging	3 915.1	52 748	1 697.7
59.	Sawmills	4 740.4	58 811	1 622.0
60.	Veneer and plywood mills	804.0	11 516	273.3
61.	Sash, door, and planing mills	1 344.1	22 960	539.3
62.	Wooden box factories	174.3	3 293	69.1
63.	Coffin industry	31.4	797	13.2
64.	Miscellaneous wood industries	418.4	6 356	141.6
69.	Pulp and paper industry	10 058.8	77 888	4 323.4
70.	Asphalt and related products	223.6	1 216	67.5
71.	Paper box and bag manufacturers	1 906.6	24 054	598.2
72.	Other paper converters	1 110.0	13 482	351.3
Total forest industries		**24 726.7**	**272 428**	**9 696.6**
Selected industries				
1.	Agriculture	147.7	4 436	79.9
73.	Printing and publishing	229.5	4 225	115.8
138.	Repair construction	312.8	4 590	122.7
150.	Railway transport	260.7	4 877	150.4
151.	Truck transport	733.2	14 860	370.6
161.	Electricity	594.6	5 343	468.4
164.	Wholesale trade	901.4	20 362	608.7
165.	Retail trade	354.9	18 576	242.7
168.	Banks and credit unions	108.3	3 749	76.4
170.	Other financial institutions and real estate	376.8	3 973	223.0
176.	Professional services to business	101.8	5 227	77.4
183.	Misc. services to business	244.0	6 736	164.4
Total sectors		**38 056.3**	**428 274**	**15 079.5**

Table C9. Direct and indirect effects of forest exports in Canada

Industries		Production ($000 000)	Jobs	GDP at factor cost ($000 000)
Forest industries				
2.	Logging	3 231.7	43 541	1 401.3
59.	Sawmills	4 223.8	51 784	1 445.2
60.	Veneer and plywood mills	279.6	4 005	95.0
61.	Sash, door, and planing mills	195.9	3 346	78.6
62.	Wooden box factories	34.9	660	13.9
63.	Coffin industry	2.0	50	0.8
64.	Miscellaneous wood industries	291.1	4 422	98.5
69.	Pulp and paper industry	8 285.6	64 158	3 561.2
70.	Asphalt and related products	59.9	326	18.1
71.	Paper box and bag manufacturers	83.9	1 059	26.3
72.	Other paper converters	143.7	1 746	45.5
Total forest industries		**16 832.1**	**175 097**	**6 784.4**
Selected industries				
1.	Agriculture	68.3	2 052	37.0
73.	Printing and publishing	78.3	1 441	39.5
138.	Repair construction	226.9	3 329	89.0
150.	Railway transport	171.7	3 212	99.1
151.	Truck transport	537.5	10 895	271.7
161.	Electricity	445.0	3 999	350.6
164.	Wholesale trade	492.7	11 129	332.7
165.	Retail trade	248.0	12 983	169.6
168.	Banks and credit unions	66.0	2 284	46.6
170.	Other financial institutions and real estate	228.4	2 408	135.2
176.	Professional services to business	66.5	3 414	50.5
183.	Misc. services to business	163.6	4 515	110.2
Total sectors		**25 194.2**	**267 347**	**10 165.0**